SECTION 15083 - PIPE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:
1. Division 7 Section "Fire Resistive Joint Systems" for firestopping materials and requirements for penetrations through fire and smoke barriers.
2. Division 15 Section "Duct Insulation" for insulation for ducts and plenums.
3. Division 15 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
4. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:
1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
2. Insulation application at pipe expansion joints for each type of insulation.
3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Removable insulation at piping specialties and equipment connections.
5. Application of field-applied jackets.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

D. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Mineral-Fiber Insulation:
      a. CertainTeed Manson.
      b. Knauf FiberGlass GmbH.
      c. Owens-Corning Fiberglas Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.
1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
1. Aluminum: 0.007 inch (0.18 mm) thick.

C. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
1. Apply insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
   a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

P. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

Q. Floor Penetrations: Apply insulation continuously through floor assembly.
1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:
1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:
   1. Apply preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:
   1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
   2. When premolded insulation elbows and fittings are not obtainable, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
   3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:
   1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
   2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
   3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

3.5 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Flexible connectors.
   2. Vibration-control devices.
   3. Fire-suppression piping.
   4. Drainage piping located in crawl spaces, unless otherwise indicated.
   5. Below-grade piping, unless otherwise indicated.
   6. Chrome-plated pipes and fittings, unless potential for personnel injury.
   7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.
   8. Medical gas piping.

3.6 INSULATION APPLICATION SCHEDULE, GENERAL

A. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

3.7 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot and recirculated hot water.
   1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
   2. Insulation Material: Mineral fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Copper Pipe, 1/2 inch (15 mm) to 2 inch (50 mm): 1 inch (25 mm) thick.
      b. Copper Pipe, 2 1/2 inch (63 mm) to 4 inch (102 mm): 1 1/2 inch (40 mm) thick.
   4. Field-Applied Jacket: Foil and paper.
   5. Vapor Retarder Required: No.
   6. Finish: None.

B. Service: Domestic cold and chilled water.
   1. Operating Temperature: 35 to 60 deg F (2 to 15 deg C).
   2. Insulation Material: Mineral fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Copper Pipe, ⅜ inch (15 mm) to 2 inch (50 mm): 1 inch (25 mm) thick.
      b. Copper Pipe, 2 1/2 inch (63 mm) to 4 inch (102 mm): 1 1/2 inch (40 mm) thick.
   4. Field-Applied Jacket: Foil and paper.
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

C. Service: Chilled-water supply and return.
   1. Operating Temperature: 35 to 75 deg F (2 to 24 deg C).
   2. Insulation Material: Mineral fiber
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Steel Pipe, 1/2 inch (15 mm) to 2 inch (50 mm): 1 inch (25 mm) thick.
      b. Steel Pipe, 2 1/2 inch (63 mm) to 6 inch (150 mm): 1 1/2 inch (40 mm) thick.
   4. Field-Applied Jacket: Foil and paper.
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

D. Service: Heating hot-water supply and return.
   1. Operating Temperature: 100 to 200 deg F (38 to 93 deg C).
   2. Insulation Material: Mineral fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Steel Pipe, 1/2 inch (15 mm) to 6 inch (152 mm): 1 1/2 inch (40 mm) thick.
   4. Field-Applied Jacket: Foil and paper.
   5. Vapor Retarder Required: No.
   6. Finish: None.

END OF SECTION 15083